AUSTRALIAN RAIL TRACK CORPORATION LTD

Discipline: Engineering (Signalling) **Category: Standard**

Train Orders

SDS 19

Applicability

ARTC Network Wide		**Western Jurisdiction**	
New South Wales	✓	**Victoria**	

Primary Source

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Document Status

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2.0	01 Feb 08	Signals Standards Engineer	Asset Management staff	Chief Operating Officer	Safety Committee 11/02/2008

Amendment Record

Version	Date Reviewed	Clause	Description of Amendment
1.1	01 Sep 04		Reformatted to ARTC Standard
1.2	14 Mar 05	Disclaimer	Minor editorial change. Document reformatted.
2.0	01 Feb 08	All	Revised throughout based on experience of TOW roll-out. Addition of Point Setting Indicator.
	13/08/2010	ALL	Superseded by ESD-08-01

Contents

19 Train Orders

19.1 Principle No. 19.1 – Train Order Working Infrastructure

19.1.1 Introduction

Train Order Working is a system of safeworking based on the issuance of an order which is acted upon by the train crew.

Train Order Working may use special infrastructure items at train order locations (i.e. those locations where an order is required for the occupation of the Main or Loop line). This infrastructure is described below.

19.1.2 Location Boards

This is a triangular shaped retro-reflective yellow board which is similar in shape and function to a landmark. A plate, with black lettering on a yellow background, is fitted to the post with the name of the location to which it refers. Where the location name is long or consists of more than one word, the lettering must not be reduced, but the sign may have more than one line of writing. Punctuation must not be included in the name. Both the location board and name plate are to have the reverse side coloured non-reflective matt grey.

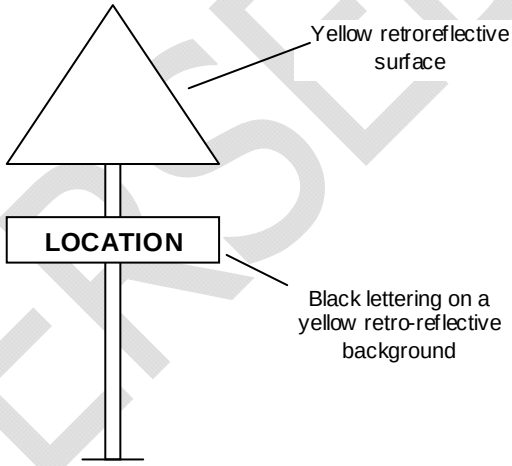


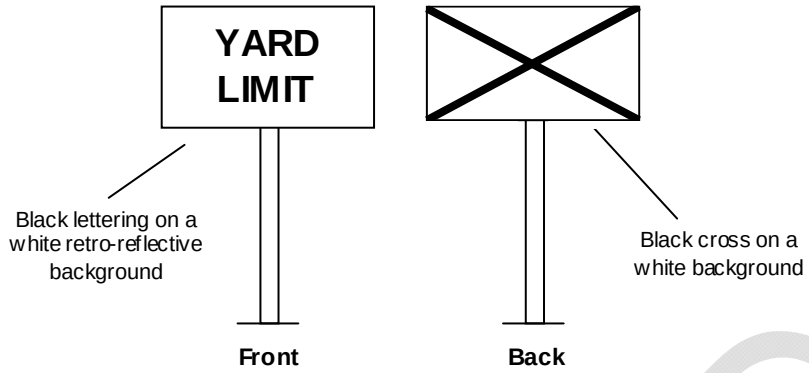
Figure 1

When passing a location board the driver is to note the location name and be prepared to stop at the Yard Limit board should the authority require, and stop at the Mechanical Point Indicator or Main Line Indicator should it be displaying a stop indication.

19.1.3 Yard Limit Boards

Yard Limit boards are provided to define the geographical limits of a train order location. Yard Limit boards also define points to which an authority may be issued, as set out in *ANSY 502*.

These boards are retro-reflective with black letters on a white background. The reverse side of the board has a black cross on a white background.



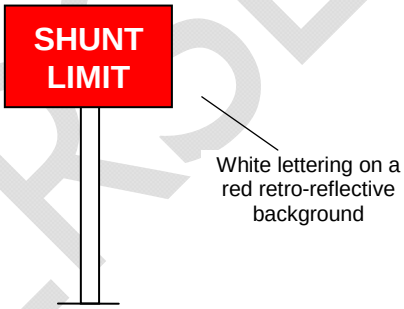
YARD LIMIT BOARD

Figure 2

19.1.4 Shunt Limit Boards

Shunt Limit boards are provided to define the shunting limits at a train order location. At locations where no crossing loop exists, Shunt Limit boards also denote the extents of the 'Main' line at that location. Shunt Limit boards also define points to which an authority may be issued, as set out in *ANSY 502*.

These boards are retro-reflective with white letters on a red background. The reverse side of the board is non-reflective matt grey.



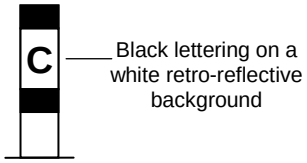
SHUNT LIMIT BOARD

Figure 3

19.1.5 Clearance Posts

Clearance Posts are used to denote the limits of the defined 'Main' and 'Loop' lines at a train order location where a crossing loop is provided. Clearance Posts also define points to which an authority may be issued, as set out in *ANSY 502*.

Clearance Posts are installed in the 6-foot, at the clearance point between the Main and Loop lines. A black 'C' is displayed on a white retro-reflective background on both sides of the post.



CLEARANCE POST

Figure 4

19.1.6 Point Indicators

Mechanical

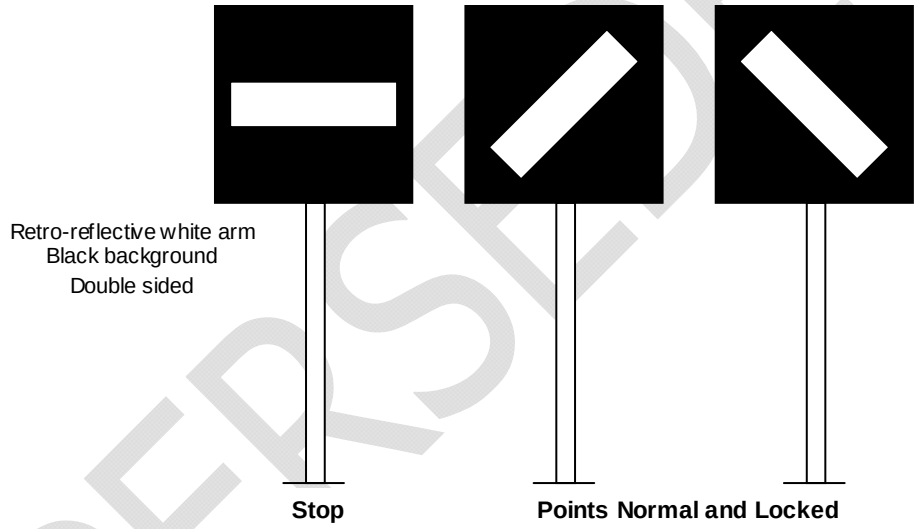
Mechanical Point Indicators are provided to give an indication to the driver that a particular set of points are set and locked, either:

- For the normal direction movement, where the points can be locked in only one position, or
- For either direction, where the points may be locked in either position, in which case a Points Setting Indicator will also be provided to indicate the direction for which the points are set.

Mechanical Point Indicators do not constitute a signal, and do not provide a movement authority to a train, the train movement itself is made on the authority of the Train Order.

The indication is displayed by a retro-reflective white bar provided against a square black background. The bar is inclined to 45º when the points are set and locked. The bar is horizontal when the points are unlocked. The indicator is double sided.

Mechanical Point Indicators of this type may be used where appropriate in other than Train Order areas.



MECHANICAL POINT INDICATOR

Figure 5

Electrical

Electrical dwarf colour light point indicators are provided to give an indication to the driver that the points in advance are either unlocked (2 red lights) or set and locked for the normal (pulsating lunar white light) or reverse (white arrow) direction movements. The train movement itself is made on the authority of the Train Order.

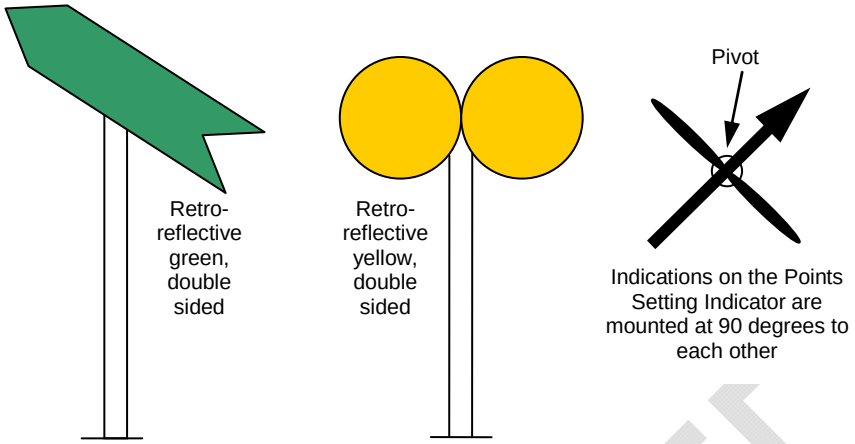
Points Setting Indicator

Points Setting Indicators are provided to give an indication to the driver of the position that a particular set of points are lying, where the points can be locked in both positions. They do not constitute a signal, and do not provide a movement authority to a train, the train movement itself is made on the authority of the Train Order. A Points Setting Indicator also does not indicate that the points are set and locked and are thus usually implemented in conjunction with a Mechanical Point Indicator.

The indication is displayed by either:

- A retro-reflective inclined green arrow for the straight route, or
- A retro-reflective yellow dumbbell for the turnout route.

The indicator body rotates by 90º around a vertical axis as the points change position to provide the relevant indication. The indication is double sided.



POINTS SETTING INDICATOR

Figure 6

19.1.7 Main Line Indicators/Repeaters

A Main Line Indicator conveys an indication to the driver that the infrastructure conditions are correct for the train to move past the indicator. This includes points (set and locked for the Main line movement) and level crossings (already operating or will operate on train approach). They do not constitute a signal, and do not provide a movement authority to a train, the train movement itself is made on the authority of the Train Order.

The indication displayed is a conventional colour-light indication. A pulsating lunar white light is used to indicate that the infrastructure conditions are correct for the train to proceed at line speed. A red light indicates that one or more of the infrastructure items past the main line indicator are not set correctly.

Where the Main Line Indicator reads up to a point where the train may be required to stop, a yellow aspect shall be used. Examples of such a situation include:

1) Where multiple Main Line Indicators are installed at a single train order location, a yellow light is used in the first indicator encountered to indicate that the next main line indicator may be at stop (refer to Principle 19.2.7),

2) Where a Mechanical Point Indicator is installed in advance of the Main Line Indicator and the points are not detected by the Main Line Indicator (normally in conjunction with a level crossing located in the centre of a location – refer to Principle 19.4.4), or

3) Where the Main Line Indicator reads up to a “STOP’ board (normally at a line terminus – refer to Principle 19.6).

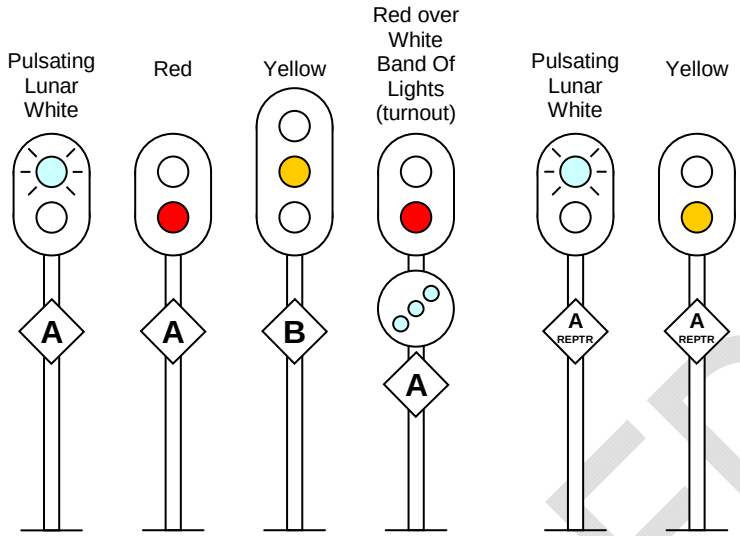
A white retro-reflective diamond is attached to the indicator post in place of a marker light.

Where motorised points are used in Train Order Working areas, a steady white band of lights is used to indicate the facing points are set for the turnout route. This may also be provided at mechanical points where a both-ways lock is used.

Main Line Indicators are to be named the same as the first ground frame beyond the indicator. The letter name is to be displayed on the white retro-reflective diamond. Where the indicator is purely for a level crossing, “X” or “Y” may be used.

Where necessary for sighting reasons, a Repeater to a Main Line Indicator may be provided. This is to take the same form as the Main Line Indicator except that the white diamond plate shall have the name 'REPTR' below the Main Line Indicator name and a yellow light is used in place of the red light.

Main Line Indicators may be used where appropriate in other than Train Order areas.

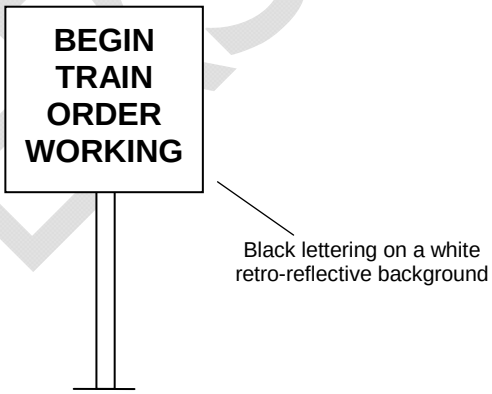


MAIN LINE INDICATORS

Figure 7

19.1.8 "Begin Train Order Working" Boards

Begin Train Order Working boards are provided to define those points beyond which a Train Order authority is required for all movements. They are not normally provided at sidings in train order locations. These boards are retro-reflective with black letters on a white background. The reverse of the board is coloured non-reflective matt grey.



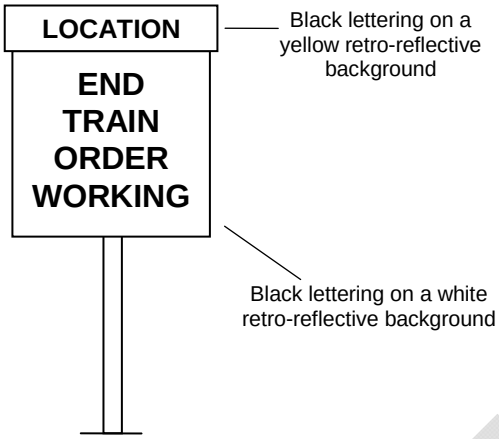
BEGIN TRAIN ORDER WORKING BOARD

Figure 8

19.1.9 "End Train Order Working" Boards

End Train Order Working boards are provided to define those points beyond which Train Order authorities no longer apply. These may be at signalled areas, or major yards where another system of safeworking is in place. They are not normally provided at sidings in a train order location. These boards have black letters on a white retro-reflective background. The reverse of the board is coloured non-reflective matt grey.

Above the End Train Order Working board is mounted a location name board (black on retro-reflective yellow) with the location name as used for the issue of Train Orders to this point.



END TRAIN ORDER WORKING BOARD

Figure 9

19.1.10 Ground Frames

Ground frames in Train Order areas are usually released by an Operators Key but can be released by a key from a releasing switch or duplex lock where provided.

The lever lock is arranged so that the key may only be removed when the points are locked and are in the normal position. (Where a both ways lock is provided, the points may be locked in either position).

19.1.11 Operators Keys

The Operators Key is inscribed "Operators Key", individually numbered and is a controlled personal issue to drivers and other staff who are required to operate points in the normal course of their duties.

19.1.12 Landmarks

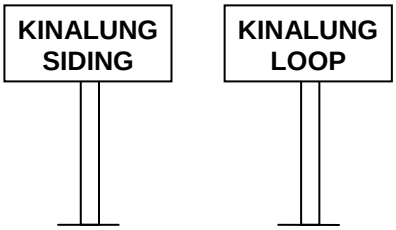
Landmarks may be used within Train Order Working areas for the same purpose as in signalled areas. When passing a landmark the driver is to be prepared to stop at the indicator or board ahead.

19.1.13 Shunting Limit or Stop Boards

"Shunting Limit in Down/Up Direction" or "Stop" boards are provided where appropriate in train order territory and are normally associated with line termini and the interface with signalled locations (refer to Principles 19.3 and 19.6). Where Begin Train Order Working boards are located at the same position as Shunting Limit boards, the "Shunting Limit in Down/Up Direction" (black on white in Train Order areas only) is to be mounted above the Begin Train Order Working board on the same post.

19.1.14 Name Boards

Name boards may be erected parallel to the track (i.e. only visible from a stationary train) and adjacent to ground frames that operate points into a loop or siding in order to identify the name of the track. These are more important where a siding and a loop exist at the one location in correctly identifying the loop or siding.



NAME BOARDS

Figure 10

19.1.15 Train Order Kilometrage Boards

Boards inscribed with the kilometrage of a specific item may be provided. Where there are existing signs such as “Yard Limit”, “Shunting Limit”, etc, the Train Order Kilometrage sign may be mounted on the same post. The kilometrage shown on these boards must be consistent with that used in the train order computer and shown on the drivers’ diagram.

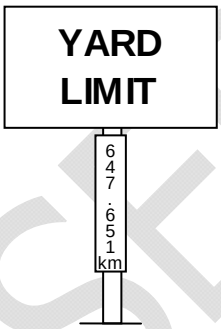


Figure 11

19.2 Principle No. 19.2 – Types and Layout of Train Order Locations

19.2.1 Introduction

The generic types and layout of Train Order locations is to be in accordance with the criteria laid out in this principle.

19.2.2 Types of Train Order Locations

To allow for different infrastructure configurations within Train Order Working territory, three generic types of train order location have been defined in the train order computer system. These locations are described below. The selection of a particular location type to be applied at a specific location should be discussed with operational representatives for that area.

Crossing Location

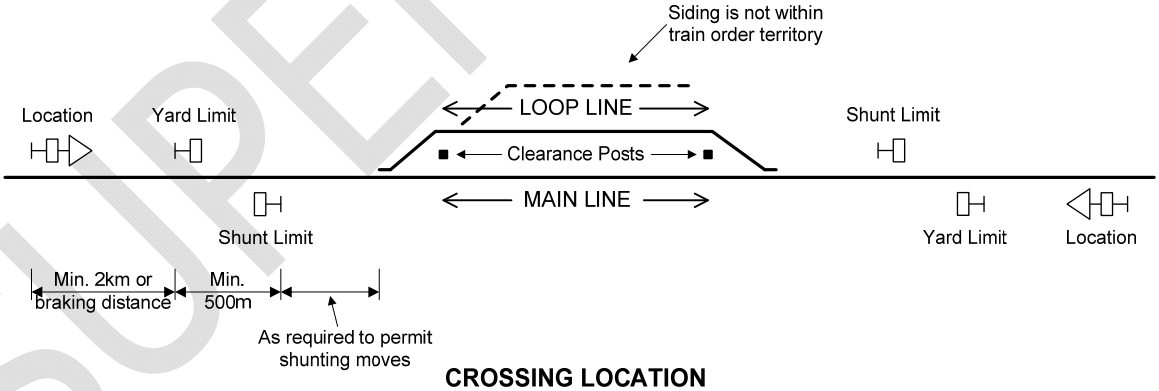
A crossing location is a train order location where a loop is provided that is frequently used for crossing of trains; this loop is considered to be within Train Order Working territory. The presence of a crossing loop is defined by the provision of clearance posts (a loop that is a siding only will not have clearance posts). Additional sidings may also exist at a crossing location, however these are considered to be outside of Train Order Working territory.

Shunt Limit boards are provided at all crossing locations and shall be located as required to permit the shunting moves necessary at each location.

Yard limit boards are located a minimum of 500m beyond the Shunt Limit Board at each end of the loop, to provide an appropriate overlap between approaching trains and any shunting moves at the location.

Location boards are positioned 2km or train service braking distance (whichever is the greater) from the Yard Limit board.

Train Orders can be issued to the Yard Limit board, Main Line or Loop Line in either direction. A Train Order to the Main or Loop line must be fulfilled between clearance posts on the respective line. Shunt orders can be issued and apply to the entire area between Shunt Limit boards.



CROSSING LOCATION

Figure 1

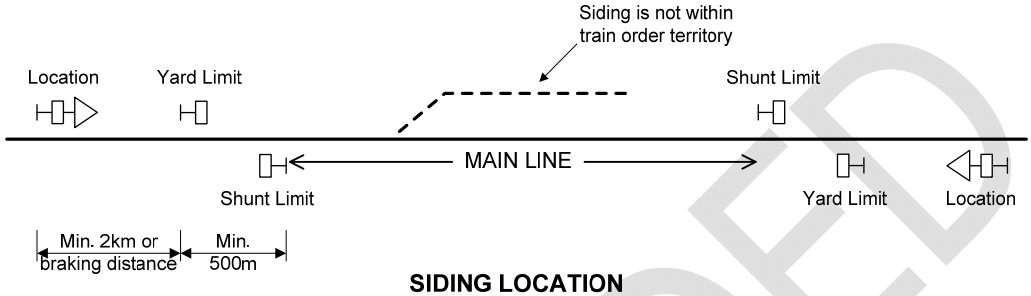
Siding Location

A siding location includes no crossing loop but provides access to non-train order sidings at the location. Siding locations are used where no practical crossing loop exists at the location, due to track configuration, siding condition, siding ownership or for other reasons, or where it is desired to permit movements (eg. loading) to take place in the siding without the requirement for a shunt order to be held. Siding locations are also used to facilitate Main line loading where this is practiced.

Clearance posts are not used at a siding location. Shunt Limit boards are provided at all siding locations and shall be located as required to permit the shunting moves necessary at each location.

Yard Limit boards are located a minimum of 500m beyond the Shunt Limit Board at each end of the loop, to provide an appropriate overlap between approaching trains and any shunting moves at the location. Location boards are positioned 2km or train service braking distance (whichever is the greater) from the Yard Limit board.

Train Orders can be issued to the Yard Limit board or Main Line in either direction. A Train Order to the main must be fulfilled between Shunt Limit boards. Shunt orders can be issued and apply to the entire area between Shunt Limit boards. When fulfilling a shunt order, a train wholly within the siding(s) is declared 'clear of train order territory' and no block will be held in the computer system for that train.



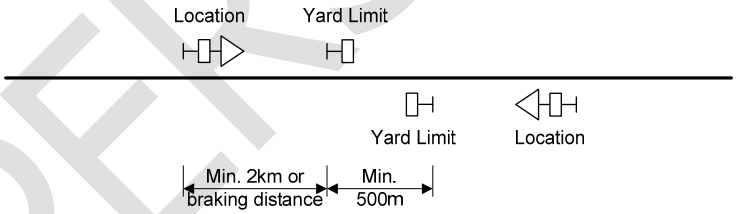
SIDING LOCATION

Figure 2

Block Location

Block locations are used to divide a long section therefore allowing trains to follow more closely. It also provides more flexibility for the issuing of track warrants within a long section. No sidings are situated at the location and it is not possible to cross trains or shunt at this location type. Opposing Yard Limit boards are located 500m apart to provide sufficient overlap for following movements.

Train Orders can be issued to the Yard Limit board in either direction. Interlocking in the computer system prevents trains approaching a block location in both directions simultaneously.



BLOCK LOCATION

Figure 3

Other Train Order Location Types

In some instances the infrastructure arrangements at a particular location do not suit the above generic location types and a specific type is required. Examples of these include:

1) Locations including junctions, and
2) Locations adjacent to other train order or signalled locations

In these instances it is necessary to discuss the specific arrangements at that location with the relevant operational staff and with the System Administrator for the train orders computer system.

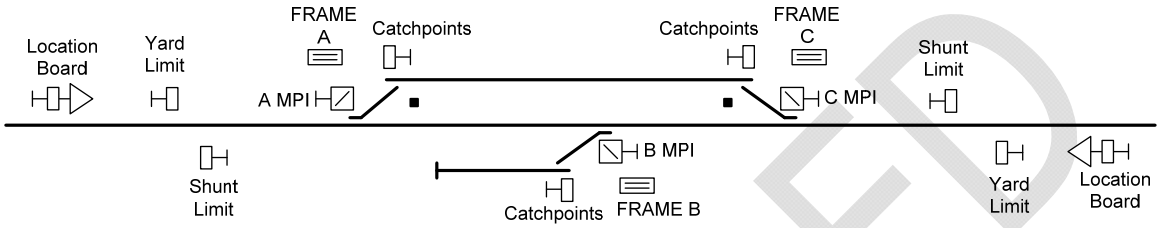
19.2.3 Mechanical Point Indicators (MPI)

All Main line mechanical points are to have mechanical point indicators, unless Main Line Indicators are provided. Mechanical Point Indicators shall be located at the mechanical points they are indicating

Where mechanical point indicators are operated from the facing point lock, a means is to be provided to prevent the points being run through and damaged in the reverse position. Such a

device would be a derail or catchpoint. Trailable point mechanisms do not require this protection. When a derail or catchpoint is provided, a "Derail" or "Catchpoint" white on retro-reflective red background board is to be provided. Trailable Points are to be provided with a "Trailable Points" notice board which is to be black on a retro-reflective white background, in accordance with Principle 14.9 in *SDS 14*.

Mechanical point indicators may also be provided on points located in the Loop line at a crossing location, irrespective of the type of indicator fitted on the Main line points, where it is desirable to reduce the delays involved in drivers checking the position of points. Mechanical Point Indicators are not required on non-interlocked points within sidings (i.e. outside of TOW territory). Refer to Figure 4.



TRAIN ORDER LOCATION WITH MECHANICAL POINT INDICATORS (MPI)

Figure 4

In some instances the use of Mechanical Point Indicators may be undesirable. These situations include:

1) Where line speeds are high, thus the sighting time of the indicator is insufficient.
2) At locations known to be affected by fog.
3) Where track curvature or other features obstruct sighting of an indicator located at the points.
4) Where Main Line Indicators are predominantly used at other locations on the line (i.e. for consistency of indication).

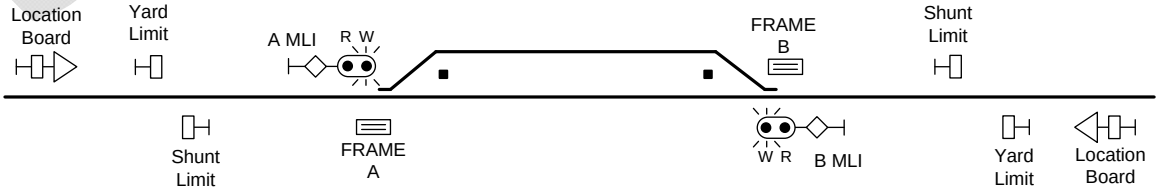
In these situations, consideration should be given to the use of Main Line Indicators in lieu of Mechanical Point Indicators.

19.2.4 Main Line Indicators (MLI)

Main Line Indicators can be used in lieu of MPIs where required for train operations, in conjunction with other infrastructure (eg level crossings or motorised points) or in the event of any of the situations described above arising.

Main Line Indicators may be located at the facing points, or not further than 300m before the facing points if required for sighting purposes. A single Main Line Indicator is to be provided at each end of the location, although refer also to Principle 19.2.8.

All facing points switches and FPL's are to be vitally detected in the Main Line Indicator which leads over the points in the facing direction. All trailing points are also to be detected in the indicators, however this detection may take a non-vital form providing that the system is configured to fail safe principles. Refer to Figure 5.



TRAIN ORDER LOOP WITH MAIN LINE INDICATORS (MLI)

Figure 5

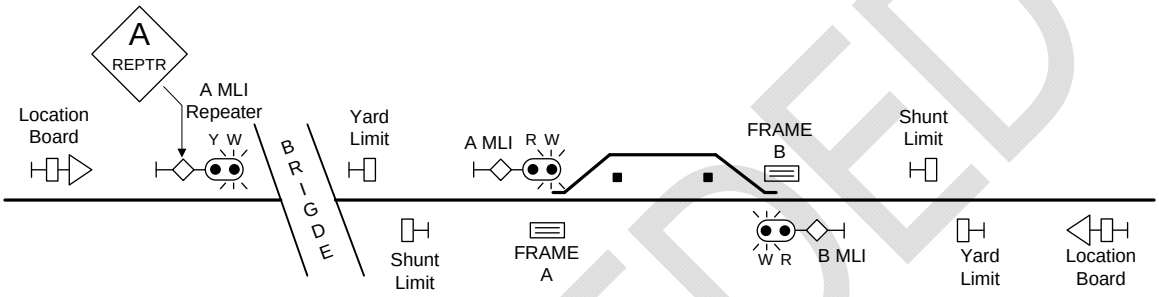
19.2.5 Repeaters to Main Line Indicators

Where necessary for sighting reasons, a Repeater to a Main Line Indicator may be provided. This is to take the same form as the Main Line Indicator except that the white diamond plate shall have the name 'REPTR' below the Main Line Indicator name and a yellow light is used in place of the red light – see Section 19.1.7 – Figure 6.

When a Repeater is used, care must be taken to avoid read-through issues between the Yard Limit Board and the Main Line Indicator repeater. In general, this will require that the Yard Limit Board is not located within 300m of the Repeater.

When a Repeater is installed, the Main Line Indicator should then be placed as close to the points as practical.

Figure 6 illustrates the general arrangements.



REPEATERS TO MAIN LINE INDICATORS (MLI)

Figure 6

19.2.6 Closely Spaced Train Order Locations

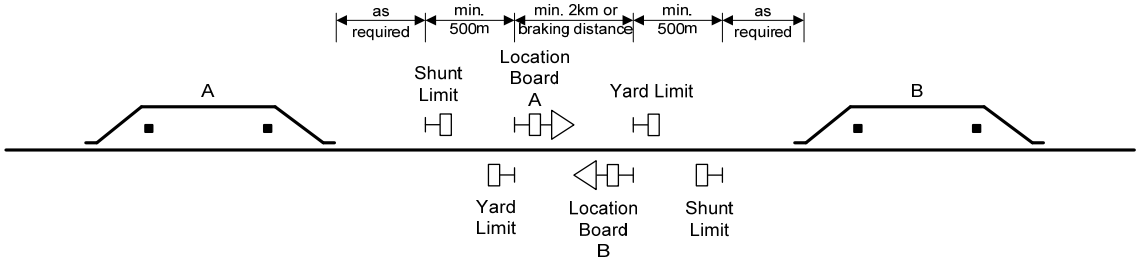
Where sidings or loops are closely spaced, the following arrangements may be applied:

1) Where, for operational reasons, it is desired to provide a train order section between the two locations, the arrangement shown in Figure 7A may be used. In this situation it is essential to ensure that the Location Board is no closer to the adjacent interlocking than that location's Yard Limit Board.

2) Where there is insufficient distance for the above to apply but is desired to maintain separate train order locations (to permit multiple shunting movements, for example), the locations may be separated by back-to-back Yard Limit Boards. The preferred arrangement is shown in Figure 7B. In this situation, Shunt Limit boards are provided 500m from the applicable Yard Limit Boards, permitting Train Orders to be issued up to the Yard Limit whilst a Shunt Order is in force at the location.

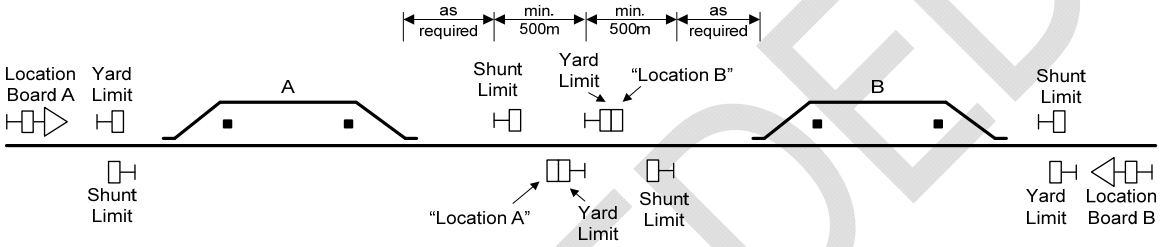
3) Where there is insufficient space for 2) above to apply but it is still desirable to create separate train order locations (for example, to allow independent shunting at two sidings), the arrangement shown in Figure 7C may be used. In this arrangement, since there is not a full overlap between Yard Limit and Shunt Limit Boards, it is not permissible to issue a Train Order up to the Yard Limit whilst a Shunt Order is in force at the location and this is to be prevented in the train order computer system.

Where the above arrangements are not appropriate due to lack of adequate distance between the two loops, the sidings or loops must be treated as a single train order location.



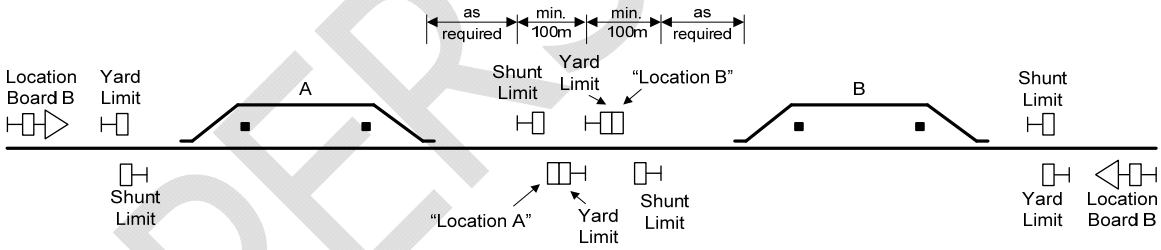
CLOSELY SPACED TRAIN ORDER LOCATIONS
ARRANGEMENT WITH A TRAIN ORDER SECTION BETWEEN THE LOCATIONS

Figure 7A



CLOSELY SPACED TRAIN ORDER LOCATIONS
PREFERRED ARRANGEMENT WITH BACK-TO-BACK YARD LIMITS

Figure 7B



CLOSELY SPACED TRAIN ORDER LOCATIONS
ALTERNATIVE ARRANGEMENT WITH BACK-TO-BACK YARD LIMITS

Figure 7c

19.2.7 Provision of Additional Main Line Indicators within Train Order Locations

In certain situations it may be necessary to provide additional Main Line Indicators to facilitate the movement of trains to and from a train order location and to provide a continuing assurance to the driver that the points remain in the correct position and any level crossing is operating. These situations include:

1) Where the train order location consists of points that are located some distance apart, and

2) Where the train order location includes one or more level crossings with Type F protection.

In this situation, the first indicator repeats the normal indication of the second indicator as well as the checking of all Main line points between the two indicators. A yellow shall be fitted to the first indicator and is displayed when the second indicator displays a stop indication.

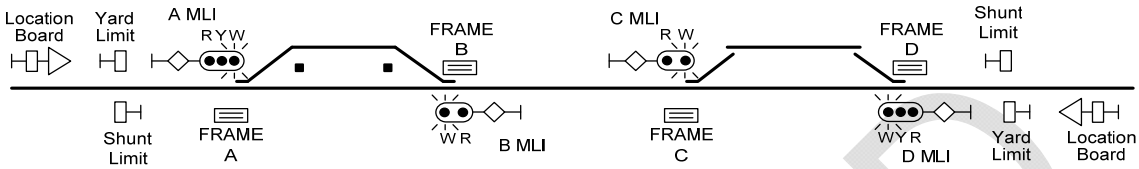
Alternatively, to avoid the need to cable between the two indicators a separate landmark may be provided for the second indicator

Additional indicators are to be provided where the distance from the first indicator to any facing points exceeds 3km, or for specific site and/or operational reasons where a benefit is given to train operation.

A diagram of the basic arrangements is shown in Figure 8A.

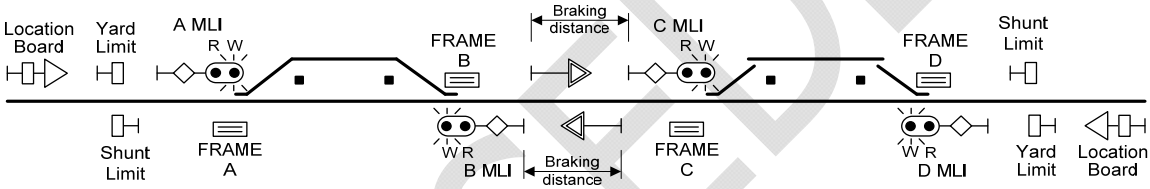
Figure 8B shows the arrangements with landmarks.

Refer also to Principle 19.7 regarding the treatment of level crossings at train order locations.



PROVISION OF ADDITIONAL INDICATORS WITHIN TRAIN ORDER LOCATIONS

Figure 8A



PROVISION OF ADDITIONAL INDICATORS WITHIN TRAIN ORDER LOCATIONS WITH LANDMARKS

Figure 8B

19.2.8 Naming of Ground Frames at Train Order Locations

Ground Frames are to be identified by letter, commencing with the letter 'A', then 'B' and so on from the Sydney end frame, and proceeding towards the Country end. The letters 'I' and 'O' should not be used.

Where a new connection is provided, the next letter after the existing ground frames shall be used. Similarly when a siding is removed the ground frames are not renumbered.

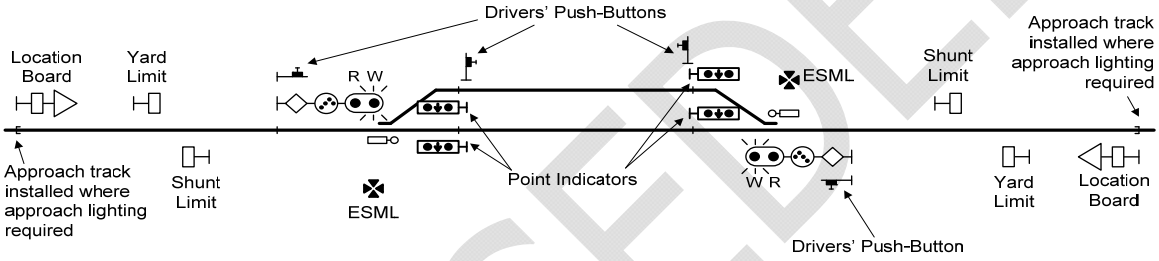
19.3 Principle No. 19.3 – Train Order Locations with Motorised Points

19.3.1 Introduction

This principle defines a train order location provided with motor operated points to facilitate train movements.

19.3.2 General Arrangement

The loop is provided with "Location" boards and "Yard Limit" boards according to the principles defined in Principle 19.2. Main Line Indicators that show both a pulsating white and turnout indications are provided at or within 300m of the facing motor worked points. The trailing ends of the points are protected by colour light point indicators which display either 2 red lights or a white arrow when the points are set for the track the indicator applies to. The arrangements are shown in Figure 1.



TRAIN ORDER LOCATION WITH MOTORISED POINTS

Figure 1

19.3.3 Track Locking

Impulse track circuits are to be provided over the motor points. Track circuiting is to be provided over the Main line between the point ends to hold the trailing end once a train has passed the facing Main Line Indicator displaying a pulsating white indication.

Release of this locking, when required, is to be in conjunction with a track time release and Operators Key to activate local pushbuttons. Once a train has seen a pulsating white or turnout indication, approach locking is to be applied.

19.3.4 Point Setting

In general, the interlocking at these locations is to permit the following movements:

1) Up Through train
2) Down Through train
3) Up Train to Loop
4) Down Train to Loop
5) Loop Up Departure *(See below)*
6) Loop Down Departure *(See below)*

To retain simple and cost effective interlocking on site, it will be permissible to remotely set 1 to 4 of the above movements. Cancellation must be performed on site through use of the Operators Key and drivers pushbuttons. Setting of points can be achieved by:

a) Control from the locomotive by radio
b) Control from a remote Control Centre

c) Drivers pushbuttons

Through movements can be automatically set upon train approach if necessary, although the usual situation will be for both Main Line Indicators to display pulsating white indications simultaneously.

Loop departures would be by drivers pushbuttons operation on site in conjunction with Operators Key operation. Automatic point normalising is provided upon loop entry or departure.

19.3.5 Emergency Operation of Points

During failures, points may be operated by an ESML or EOL facility. The use of the ESML is to ensure that the main line indicators display a red indication when the key or crank is removed for use.

19.3.6 Use of Repeating Indicators

A pulsating yellow aspect may be provided on repeaters reading up to turnout indication. These repeaters must comply with Principle 19.2.5.

19.4 Principle No. 19.4 – Level Crossings at Train Order Locations

19.4.1 Introduction

This principle describes the various infrastructure options where a Type 'F' level crossing is situated within or adjacent to a train order location. This principle should be read in conjunction with Principles 18.7 and 18.8 in *SDS 18*.

19.4.2 Arrangement where the Level Crossing is some distance from the Loop / Siding

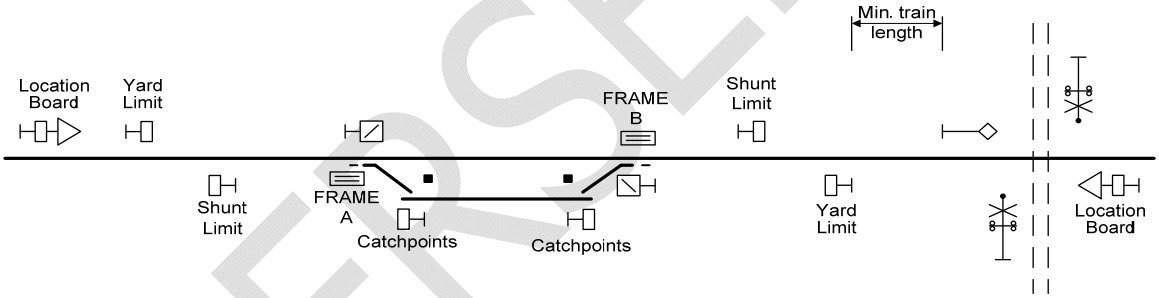
Where a level crossing is located some distance from the loop or siding at a train order location, the Yard Limit and Shunt Limit boards should be situated to avoid the unnecessary operation of the level crossing.

Preferred arrangements are:

1) If there is sufficient distance between the siding and the level crossing, the Yard Limit Board should be positioned so that a train standing at the board is clear of a level crossing in the rear and thus does not cause tail-flashing.

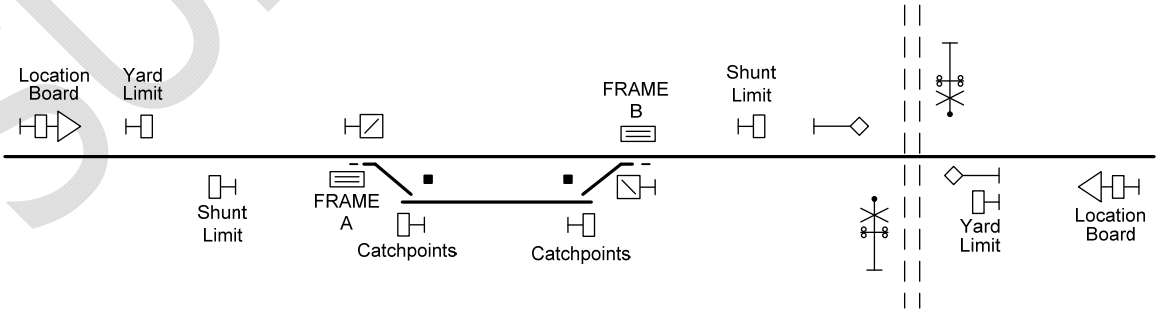
2) Alternatively, Yard Limit and Shunt Limit Boards should be positioned at the extremities of the level crossing approach tracks so that the level crossing falls between the boards.

These two alternatives are shown in Figures 1 and 2 respectively.



LEVEL CROSSING SOME DISTANCE FROM A TRAIN ORDER LOCATION

Figure 1



LEVEL CROSSING SOME DISTANCE FROM A TRAIN ORDER LOCATION ALTERNATIVE ARRANGEMENT

Figure 2

In situations where the above is not possible or causes additional complications (for example, due to the proximity of a second level crossing or train order location), a Main Line Indicator

may be used to prevent unnecessary operation of the level crossing. Such an indicator would be normally at stop, with the indicator cleared as required when a train has an order to proceed. Clearing of the indicator can be achieved by:

a) Control from the locomotive by radio

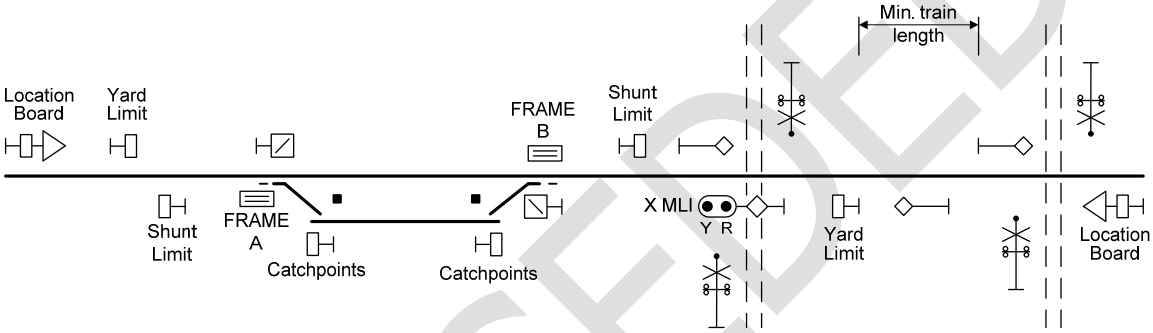
b) Control from a remote Control Centre

c) Drivers pushbuttons

d) Whistle activation or other suitable means

Should a Main Line Indicator be required this is to be installed with the same requirements as a Repeater for a Main Line Indicator in Principle 19.2.5. If the sidings ahead are fitted with Mechanical Point Indicators, the Main Line Indicator should use a yellow aspect instead of a pulsating white.

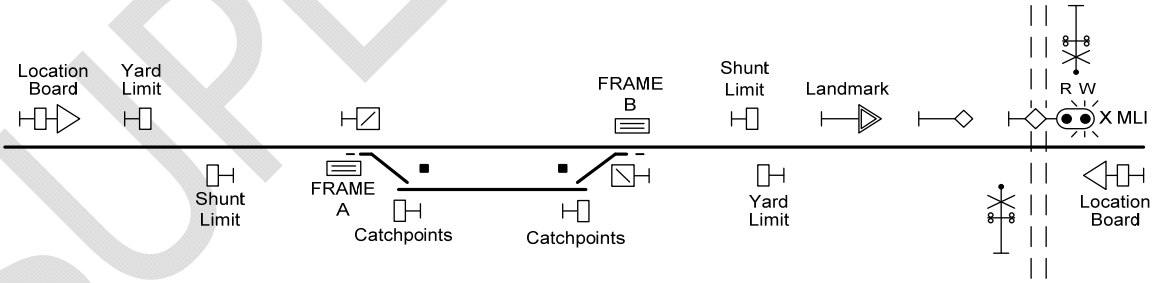
Refer to Figure 3.



LEVEL CROSSING SOME DISTANCE FROM A TRAIN ORDER LOCATION ARRANGEMENT WITH MLI AT LEVEL CROSSING

Figure 3

A Main Line Indicator may also be used to prevent tail-flashing of a level crossing due to a train stopped at a Yard Limit Board. In this arrangement, the indicator would normally show a pulsating white aspect but would revert to red until the departure track circuit re-energised. A separate landmark would normally be required. Refer to Figure 4.



LEVEL CROSSING SOME DISTANCE FROM A TRAIN ORDER LOCATION ARRANGEMENT WITH MLI TO PREVENT TAIL FLASHING

Figure 4

19.4.3 Arrangement where the Level Crossing is close to the Loop / Siding

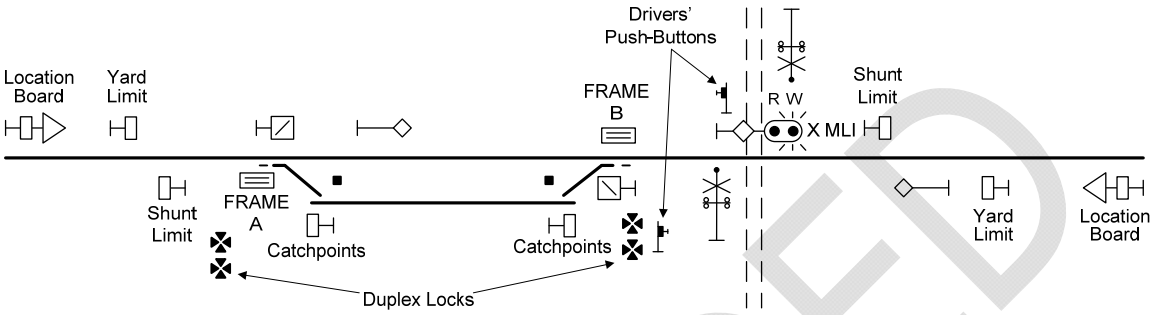
Where a level crossing is located close to the loop / siding such that the level crossing approach track will be occupied in shunting moves, a Main Line Indicator shall be provided.

The Main Line Indicator will normally display a pulsating white light, indicating that the level crossing will operate on train approach. Points at the location are released by duplex lock or releasing switch (which is released by Operators key) and taking the duplex lock or releasing

switch will cause the Main Line Indicator to revert to red and the level crossing to cease operation.

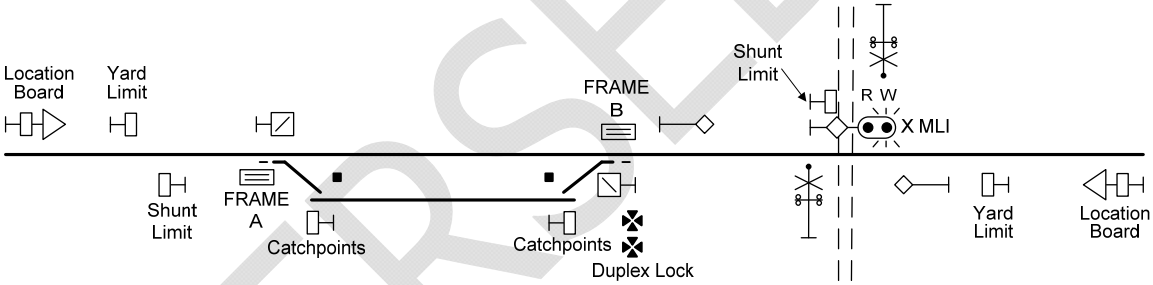
Shunting switches are used to operate the level crossing as required during shunting operations. These are provided at appropriate locations, typically at the points and at the Main Line Indicator. Alternatively, if sufficient space is available the Shunt Limit board may be positioned adjacent to the Main Line Indicator.

Refer to Figures 5A and 5B.



LEVEL CROSSING ADJACENT TO A TRAIN ORDER LOCATION

Figure 5a



LEVEL CROSSING ADJACENT TO A TRAIN ORDER LOCATION ALTERNATIVE ARRANGEMENT

Figure 5b

In some situations it may be preferable for the Main Line Indicator to normally display a red light and to prove the level crossing operating before the Main Line Indicator clears. Examples where this is appropriate include where there is a higher than usual chance that the level crossing is obstructed, or where the potential consequences of non-operation of the level crossing are higher than usual. In this arrangement, steps must be taken to minimise the potential for anticipation by the driver of the Main Line Indicator clearing on approach.

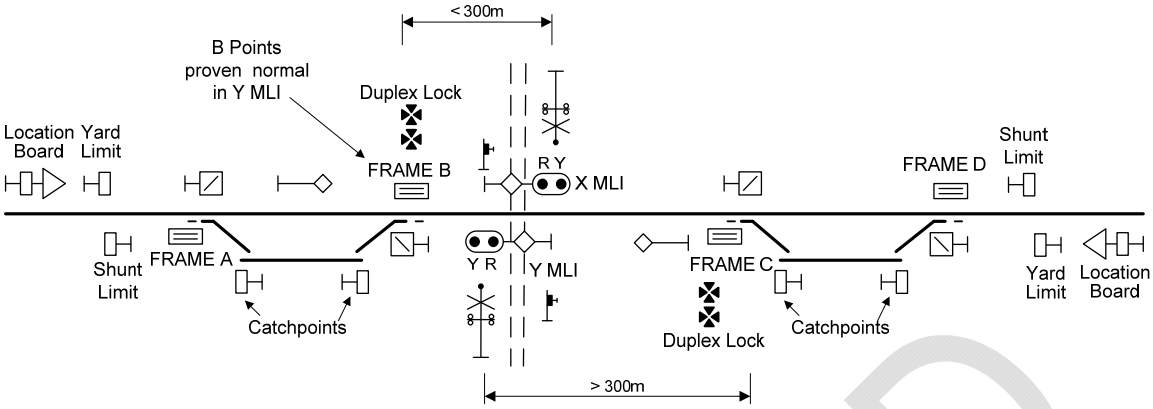
Refer also to Principles 18.7 and 18.8 in *SDS 18*.

19.4.4 Arrangement with Sidings on each side of the Level Crossing

At locations with sidings on or near the approach track on both sides of a level crossing, some combination of the arrangements described in 19.4.2 and 19.4.3 shall generally apply, with the necessary arrangements on each side of the level crossing being considered separately.

To eliminate the need to detect points through the location where Mechanical Point Indicators are used, a yellow aspect may be used in lieu of pulsating white in Main Line Indicators located at the level crossing. In this instance, when the points are provided with a mechanical point indicator and are located 300m or less from the Main Line Indicator, the ground frame normal is to be proved in the yellow aspect of the Main Line Indicator to prevent a possible 'read through' of the mechanical point indicator.

Refer to Figure 6.



LEVEL CROSSING WITH SIDINGS ON EACH SIDE

Figure 6

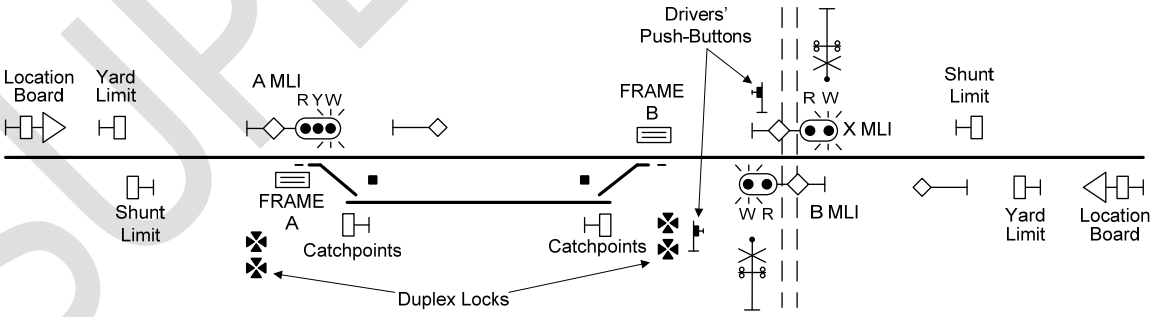
19.4.5 Specific Provisions for Passenger or Stopping Trains

Where passenger or other trains regularly stop on the approach to a level crossing, steps must be taken to prevent the level crossing from operating until the train is ready to proceed (refer to Principle 18.7 in *SDS 18*). In Train Order Working areas, this requires the Main Line Indicator at the level crossing to be held at stop on the approach of the train. Once the train is ready to proceed, the level crossing may be operated in accordance with Principle 18.7.4 in *SDS 18*.

In situations where the stopping move is discrete and regular (typically a passenger train), a timer may be used to hold the Main Line Indicator at stop around the time the stopping move is scheduled to occur. The Main Line Indicator normally displays a pulsating white light at other times.

19.4.6 Level Crossings at Locations Equipped with Main Line Indicators

Where level crossings with Type 'F' protection are located adjacent to locations equipped with Main Line Indicators, multiple Main Line Indicators will be required in one or both directions of travel. These shall conform to the requirements of Principle 19.2.7. An example of such an arrangement is shown in Figure 7.



TRAIN ORDER LOCATION WITH MAIN LINE INDICATORS AND LEVEL CROSSING

Figure 7

19.5 Principle No. 19.5 – Junctions at Train Order Locations

19.5.1 Introduction

This principle describes the infrastructure arrangements to be used at branch line junctions in train order working territory.

19.5.2 Normal Arrangement

The normal arrangement at a junction within a train order location is to apply standard train order working infrastructure as described in Principle 19.2. However, this arrangement may result in operational inefficiencies.

Typically, the use of a standard ground frame will require the second person of a train taking the branch line to wait at the junction points until the train is fully clear, then normalise the frame and walk the length of the train to rejoin. For a train exiting the branch line, the second person would likewise wait at the junction points until the train is fully clear. The train can then propel to permit the second person to rejoin before departing the location.

Where these procedures are unacceptable or the inefficiencies are undesirable, alternative approaches may be used. These are outlined below.

19.5.3 Arrangement using Mechanical Trailable Points

Trailable points would typically be used where one route through the junction is to be given priority. The use of trailable points will result in the same operational impact on trains taking the branch line as described above. However, a train exiting the branch line will be able to proceed according to its train order, without the need to stop, set points or propel to collect the second person. For trains using the main line, trailable points are treated in the same way as a normal set of points with a mechanical point indicator.

The application of trailable points is described in Principle 14.9 in *SDS 14*.

19.5.4 Arrangement using a Both-Ways Lock

A both ways lock would typically be used where it is desirable to give both routes equal priority through the junction. Using a both ways lock, points may be set and locked in either direction. Trains approaching the location are required to verify the lie of the points and, if necessary, stop and set the points as required. However there is no requirement to restore the points to their original position and trains may depart directly. If a train approaching the points observes that they are lying correctly for the required movement, there is no need for the train to stop.

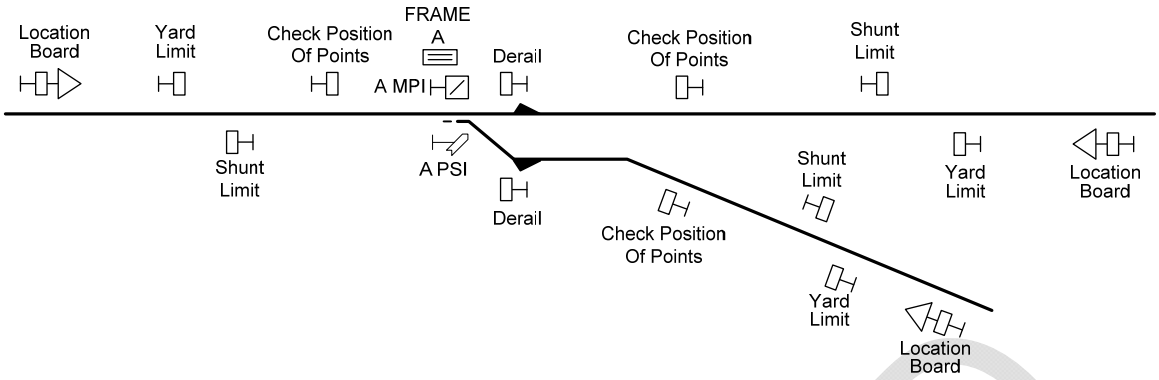
Arrangement with Mechanical Indicators

When using a both-ways lock with mechanical indicators, it is necessary to provide both a Mechanical Point Indicator and a Points Setting Indicator. Typically these will be provided on opposite sides of the track to enable effective sighting.

A means is to be provided to prevent the points being run through and damaged when in the incorrect position for a trailing movement. Such a device would be a derail or catchpoint. As the points can be locked both ways, two devices will be required, one for each trailing move. A "Derail" or "Catchpoint" sign shall be provided for each.

Notice boards are provided on the approach to the points from each direction, stating “CHECK POSITION OF POINTS”, white on retro-reflective red background board. The position of these notice boards is agreed through signal sighting but boards are generally located to give the driver sufficient time to stop if the points are incorrectly set. Typically, a permanent speed restriction will also be required in all directions through the location commensurate with the sighting distance available.

A diagram of the arrangements is shown in Figure 1.



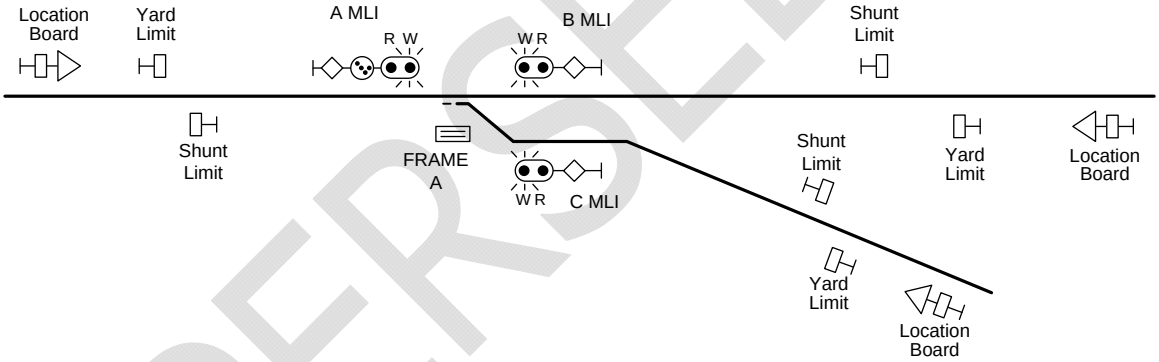
JUNCTION LOCATION WITH BOTH-WAYS LOCK AND MECHANICAL INDICATORS

Figure 1

Arrangement with Main Line Indicators

When using a both-ways lock with Main Line Indicators, a turnout indication (steady white band of lights) is used to indicate the facing points are set for the turnout route. Typically, the increased sighting distance for the Main Line Indicator will alleviate the need for a permanent speed restriction to be applied through the location.

A diagram of the arrangement is shown in Figure 2.



JUNCTION LOCATION WITH BOTH-WAYS LOCK AND MAIN LINE INDICATORS

Figure 2

19.5.5 Arrangement using Motorised Points

Motorised points may be used at a junction to provide greater efficiency of operation. The arrangement of infrastructure is generally in accordance with Principle 19.3.

Points would normally be set for the main line movement. For moves to and from the branch line, point setting can be achieved by:

a) Control from the locomotive by radio

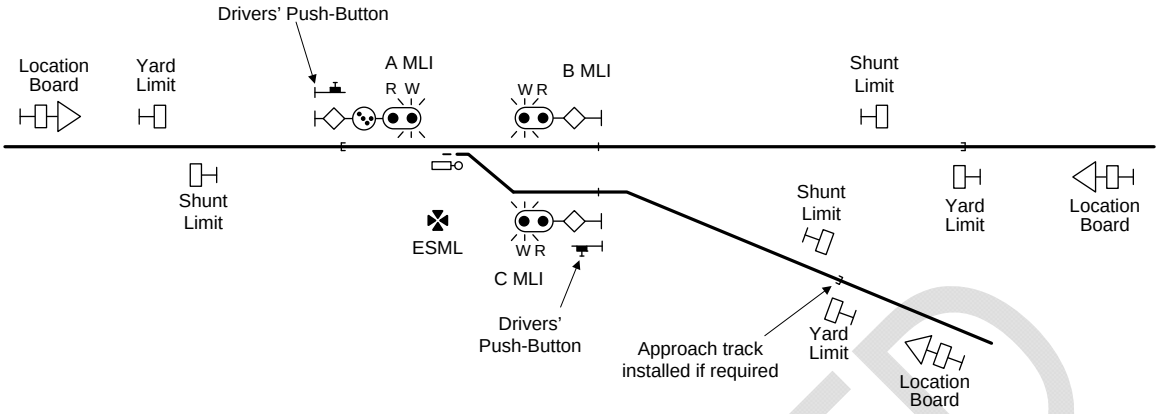
b) Control from a remote Control Centre

c) Drivers pushbuttons.

Automatic point normalising is provided on train departure.

For trailing moves from the branch line, an approach track circuit may be provided to drive the points reverse on train approach. In this situation, an approach track is also to be provided on the main line. The approach of a train on either line will qualify out the other approach track circuit, in order to prevent the points being driven reverse when a main line train is approaching. To avoid problems where one train is waiting at the Yard Limit Board for another to pass the location, approach track circuits must not extend beyond the Yard Limit Board on either line.

Refer to Figure 3.



JUNCTION LOCATION WITH MOTORISED POINTS

Figure 3

19.6 Principle No. 19.6 – Arrangements of Infrastructure at Train Order Boundaries

19.6.1 Introduction

This principle details the specific arrangement of infrastructure between a train order section and a signalled area.

19.6.2 Arrangement where Shunting Outside of the Home Signal is Not Required

If trains approaching a signalled interlocking from a train order section will not encounter another train order location, a landmark is to be provided before the home signal in the normal way. (If circumstances require, this may be a distant signal).

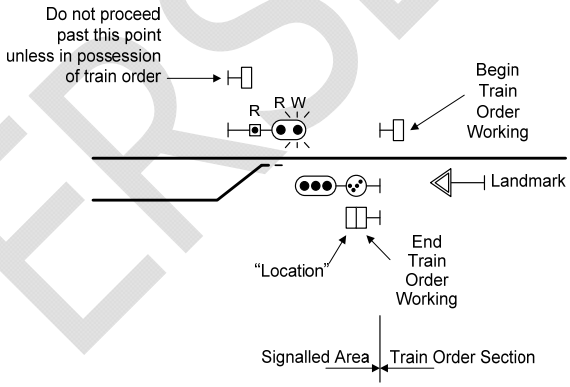
The "End Train Order Working" board is to be located adjacent to the home signal. The location name board is to be mounted above the End Train Order Working Board.

The starting signal into the train order section is to display a pulsating white indication in lieu of a green light.

A board inscribed “DO NOT PROCEED PAST THIS POINT UNLESS IN POSSESSION OF TRAIN ORDER” is to be provided adjacent to the Starting Signal.

The "Begin Train Order Working" board is located adjacent to the “End Train Order Working" board.

A diagram of the arrangements is shown in Figure 1.



TRAIN ORDER SECTION ADJACENT TO SIGNALLED AREA

Figure 1

19.6.3 Arrangement where Shunting Outside the Home Signal is Required

This arrangement may be adopted where it is necessary to shunt outside the home signal but it is not desired to block the train order section.

A "Yard Limit" board is to be located a minimum of 2 Km from the home signal and the Location Board is to be positioned 2km or train service braking distance (whichever is the greater) from the Yard Limit board.

To define the start of the train order location for trains entering from the signalled area, a location name plate is mounted above a Yard Limit board installed adjacent to the home signal.

In order to discriminate between the signalled location as a termination point for Train Orders and the train order location that exists between the home signal and the "Yard Limit" board, a separate location name shall be given to the train order location. This name may be the

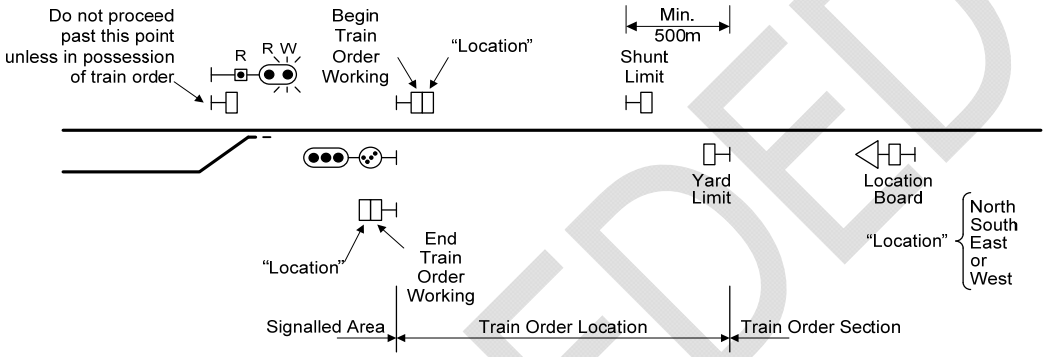
signalled location name plus "North, South, East or West," or an alternative location name as appropriate.

The starting signal into the train order section is to display a pulsating white indication in lieu of a green light. A board inscribed “DO NOT PROCEED PAST THIS POINT UNLESS IN POSSESSION OF TRAIN ORDER” is to be provided adjacent to the Starting Signal.

The "Begin Train Order Working" board is located adjacent to the “End Train Order Working" board.

Should a distant signal be required this is to be installed with the same requirements as a Repeater for a Main Line Indicator in Principle 19.2.5. Distant signals should be track circuited and preferably three position.

A diagram of the arrangements is shown in Figure 2.



TRAIN ORDER LOCATION ADJACENT TO SIGNALLED AREA

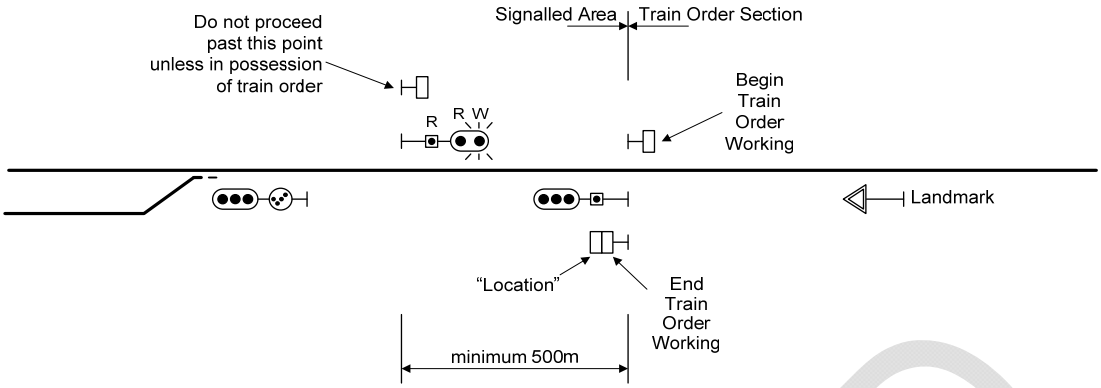
Figure 2

19.6.4 Arrangement where a Dedicated Starting Signal is provided

This arrangement is used to facilitate shunting without blocking the section. In this instance the shunting move is wholly contained within the signalled location.

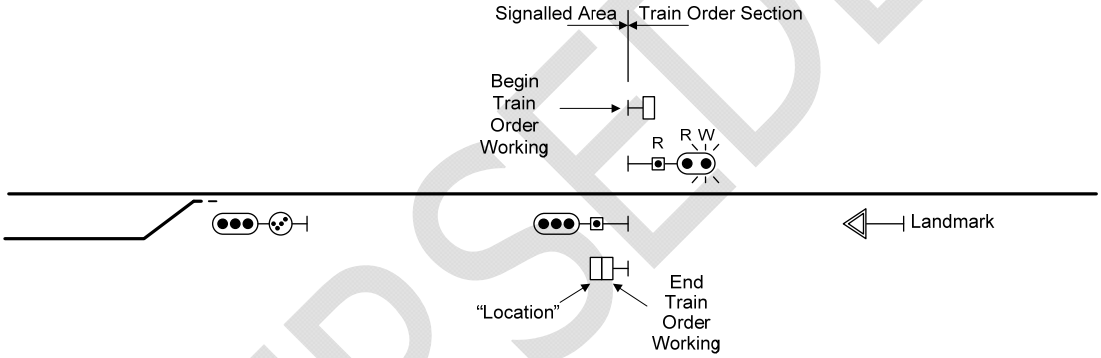
The preferred arrangement is to provide a 500m overlap between the home and starting signals and thus between opposing moves (Figure 3A). Where this length of overlap is not available (when converting existing lines to Train Order Working), a shorter overlap may be provided or, if the home and starting signals are adjacent, the Begin and End Train Order Working Boards may be positioned alongside these signals (Figure 3B).

A board inscribed “DO NOT PROCEED PAST THIS POINT UNLESS IN POSSESSION OF TRAIN ORDER” is to be provided adjacent to the starting signal, where this is not located at the same location as the “Begin Train Order Working" board.



TRAIN ORDER SECTION ADJACENT TO SIGNALLED AREA
PREFERRED ARRANGEMENT WHERE DEDICATED STARTING SIGNAL PROVIDED

Figure 3a



TRAIN ORDER SECTION ADJACENT TO SIGNALLED AREA
ALTERNATIVE ARRANGEMENT WHERE DEDICATED STARTING SIGNAL PROVIDED

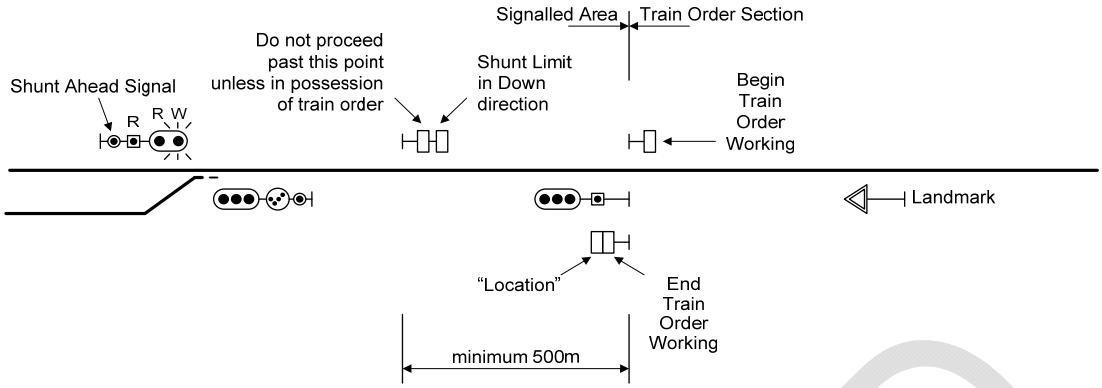
Figure 3B

19.6.5 Arrangement where a "Shunting Limit" Board is provided

This arrangement is a variation to 19.5.4 above and is shown in figures 4A & 4B. Again, the preferred arrangement is to provide a 500m overlap between the home and starting signals and thus between opposing moves.

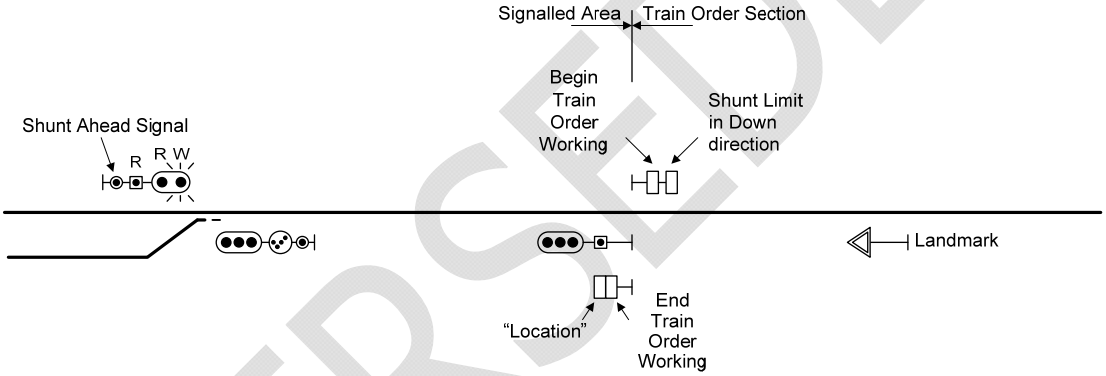
It should be noted that a shunting signal is normally required on the Starting Signal for movements up to the Shunting Limit board. A pulsating white indication is displayed for through trains that would require a Train Order.

A board inscribed "DO NOT PROCEED PAST THIS POINT UNLESS IN POSSESSION OF TRAIN ORDER" is to be provided adjacent to the shunting limit board, where this is not located at the same location as the "Begin Train Order Working" board.



TRAIN ORDER SECTION ADJACENT TO SIGNALLED AREA
PREFERRED ARRANGEMENT WHERE SHUNT LIMIT BOARD PROVIDED

Figure 4A



TRAIN ORDER SECTION ADJACENT TO SIGNALLED AREA
ALTERNATIVE ARRANGEMENT WHERE SHUNT LIMIT BOARD PROVIDED

Figure 4B

19.6.6 Arrangement with a Siding within a Train Order Location adjacent to a Signalled Interlocking

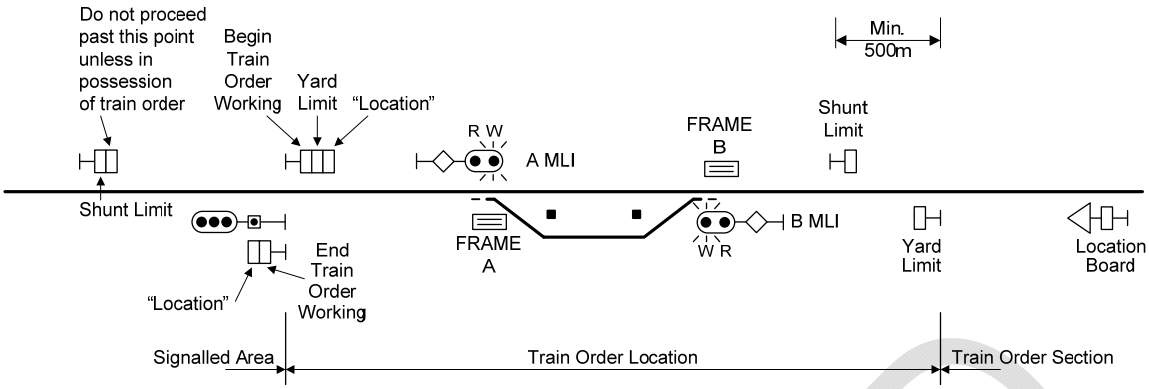
Where a siding is located adjacent to a signalled location, a train order location shall be created adjacent to the signalled location to contain the siding. This is a variant to the arrangement described in 19.5.3, with the arrangement of infrastructure at the location generally in accordance with Principle 19.2.2.

When the ground frame is provided with a mechanical point indicator, and the frame is 300m or less from the home signal, the ground frame normal is to be proved in the main head aspect of the home signal to prevent a possible 'read through' of the mechanical point indicator.

The pulsating white indication on the starting signal must also detect the points normal.

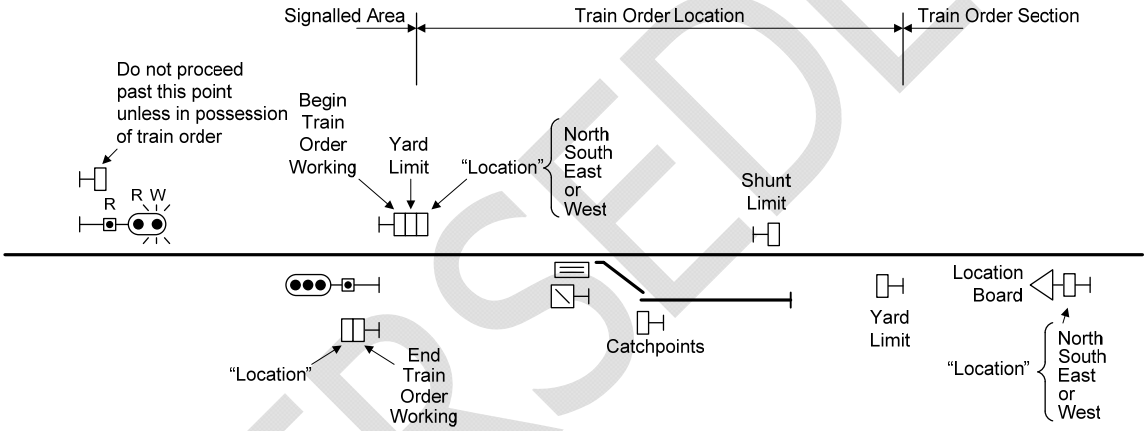
Should the frame be closer than 300m to the home signal, but the home signal cannot be seen from the ground frame (or beyond), the requirement for proving the ground frame normal in the home signal main aspect may be omitted, however the points detection will still be required in the starting signal pulsating white indication.

Refer to Figures 5A and 5B.



TRAIN ORDER LOCATION ADJACENT TO SIGNALLED AREA

Figure 5A



TRAIN ORDER LOCATION ADJACENT TO SIGNALLED AREA

Figure 5B

19.7 Principle No. 19.7 – Infrastructure Arrangements at Line Termini worked by Train Orders

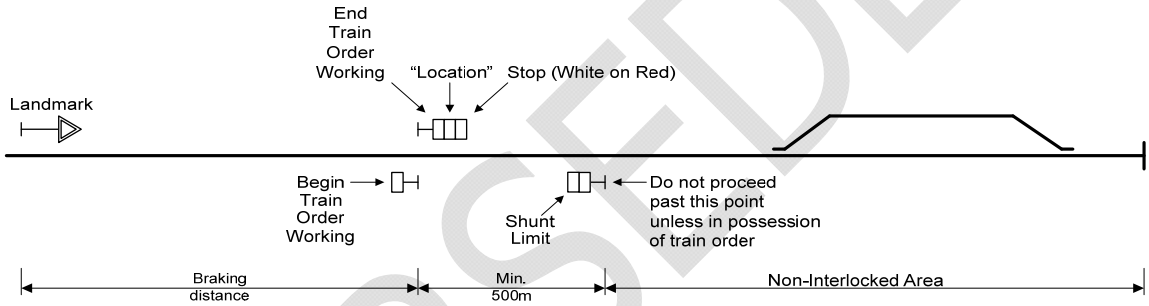
19.7.1 Introduction

This principle details the specific infrastructure arrangements between a train order section and a non-signalled location.

19.7.2 Arrangement where a Train Order Section is adjacent to a Non-Interlocked Area

Where trains are not required to be held outside the non-interlocked area

As trains approaching will not encounter another train order location, a landmark is to be provided a minimum of braking distance from a 'STOP' board which protects the non-interlocked area. The 'STOP' board is to be mounted above the "End Train Order Working" board. Adjacent to this and facing to trains leaving the non interlocked area is to be the "Begin Train Order Working" board. The arrangements are shown in Figure 1.



TRAIN ORDER LOCATION ADJACENT TO NON-INTERLOCKED AREA

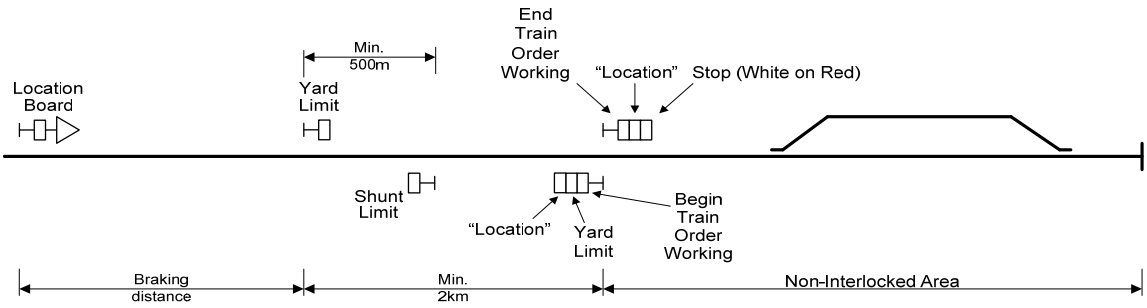
Figure 1

In this arrangement the 'STOP' board is to be located relatively close to the non-interlocked area so that there is no necessity for a formal safeworking system to control movements from the 'STOP' board on the single lines before the non-interlocked area. This will be dependent on visibility, and traffic level considerations, and the need for trains to shunt on to the single line without occupying the Train Order section.

Procedures for passing the 'STOP' board will be defined in the Local Appendix.

Where trains are required to be held outside the non-interlocked area

Where there is a regular need for trains to be held outside the non-interlocked area a train order location may be established. These arrangements are shown in Figure 2.



TRAIN ORDER LOCATION ADJACENT TO NON-INTERLOCKED AREA

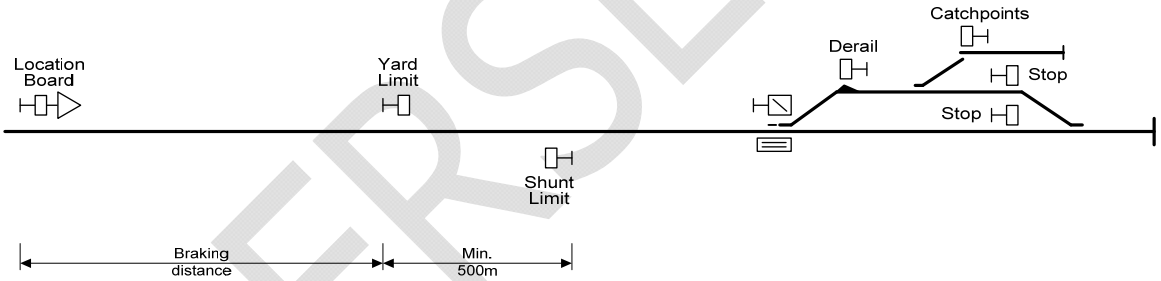
Figure 2

Criteria for location of the 'STOP' board are described above.

19.7.3 Arrangement where Terminus is a Train Order Location

This arrangement requires occupancy of the Main or Loop line to be by authority of a Train Order. Consequently infrastructure is generally in accordance with Principle 19.2. A diagram is shown for this arrangement in Figure 3.

'STOP' boards may be located where appropriate to protect non-interlocked areas such as shown in Figure 3.



ARRANGEMENT WHERE TERMINUS IS A TRAIN ORDER LOCATION

Figure 3

19.8 Principle No. 19.8 – Locations not to be considered Train Order Areas

19.8.1 Introduction

Certain locations, because of their track complexity, and their level crossing protection requirements combined with operational needs, cannot be adequately covered with train order infrastructure. These locations are to be normal signalled areas and removed from the train order area.

19.8.2 Conditions that cannot be fulfilled by Train Order Infrastructure

Where the following situations occur, consideration is to be given to normal signalling in lieu of train orders:

a) Where train movements are more effectively controlled by a Signaller with signal box type facilities.

b) Where multiple indicators or signals are required in the one running direction and it is necessary to have one provide a warning that the next signal is displaying a restrictive indication (eg stop or turnout).

c) Where shunting movements are to occur in loops or Main lines by private operators not specifically accredited for Train Order Working, or fitted with train radio.

d) Where one or more level crossings exist where protective main line indicators or signals may require to be cleared without a clearance right through the interlocking, or for shunting purposes.

e) Some combination of the above.